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SOVIET ATOMIC ENERGY PROGRAM

INTER-AGENCY REPORT

DOE review
completed.

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THE SOVIET ATOMIC ENERGY PROGRAM

THE PROBLEM

To review significant recent developments in the USSR's atomic energy program and to estimate the probable future course of that program to mid-1965.

SUMMARY AND CONCLUSIONS

GENERAL

1. We have reflected delays in the estimated Soviet nuclear power reactor program and incorporated new information into our estimates of the Soviets' nuclear propulsion program and of their nuclear weapon facilities. We believe that the estimate of Soviet plutonium production based on information on known sites represents the most likely value for current cumulative production. However, certain factors indicate that Soviet plutonium equivalent production could be considerably higher and any planning should give serious consideration to the upper range of the estimate which is based on ore availability.¹

NUCLEAR REACTOR PROGRAM

2. *Power Reactors.* It is apparent that the USSR will fall far short of the 2000-2500 electrical megawatt nuclear generating capacity originally projected for 1960 in the Sixth Five-Year Plan. After considering the delays the Soviets have experienced in both research and power re-

actor programs we now estimate that the USSR will have only about 1100 electrical megawatts of nuclear generating capacity installed by mid-1965.

3. *Naval and Marine Nuclear Propulsion Systems.* The ice-breaker LENIN was commissioned in December of 1959 and is expected to operate in the Arctic in the summer of 1960. There have been increasing numbers of reports that the Soviets are constructing a number of nuclear submarines, but we have no firm evidence that any are in operational status. Based on the status of Soviet reactor technology, we estimate that late 1957 was the earliest date that a nuclear propulsion reactor for a submarine could have been available, and that at least one Soviet nuclear submarine could have been in a trial status by the end of 1958.

4. *Reactor Systems for Aircraft.* Our information indicates that the Soviets are attempting to produce an aircraft nuclear propulsion (ANP) system, but we have not determined the exact systems under development. We estimate that the Soviets are now capable of flying a nuclear

¹For the minority views see footnotes 4 and 5, page 3.

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testbed with at least one nuclear power unit providing useful thrust during a phase of the flight. By 1962, such a program could lead to an ANP system suitable for cruise on nuclear heat alone in a subsonic aircraft of marginal performance. We believe that a nuclear propulsion unit for a first subsonic aircraft with substantially improved performance could be available by sometime in 1964. Supersonic applications of ANP would require a long test and development program, and we do not believe that a prototype will be achieved during the period of this estimate.

5. *Reactor Systems for Rockets and Ramjets.* We believe that the USSR is now conducting research on a nuclear rocket engine, and that the Soviets could conduct a first static test firing of a prototype system possibly as early as 1965. While there is evidence of Soviet research applicable to nuclear ramjets, we believe that the complexity of the problem makes it unlikely that the Soviets will flight test a nuclear ramjet during the period of this estimate, although such flight testing is possible.

FISSIONABLE MATERIALS PRODUCTION

6. *Uranium Ore.* Recent information indicates that the Soviets have matched many mining and ore concentration methods used in the US, and that uranium mining and ore concentration within the Soviet Bloc continued to expand at a modest rate during 1959. We estimate that by the end of 1959 about 110,000 metric tons of recoverable equivalent uranium metal would have been available to the Soviets and that about 200,000 metric tons will have been available by the end

of 1964 [redacted] As in previous years, these amounts are in excess of the recoverable equivalent uranium metal required to support our current estimate of fissionable materials production.

7. *Uranium-235.* [redacted]

8. While the error limits of the estimate could range from 50% smaller to 25% larger, we believe that the Soviets will have produced on the order of 50 metric tons of weapon-grade U-235 by mid-1960 and that the cumulative total will have increased to about 200 metric tons by mid-1965.²

9. *Plutonium Equivalent.*³ We estimate that the most likely value of Soviet cumulative plutonium equivalent production through mid-1960 is that based on available site information. However, in view of the large estimated Soviet ore supply, we believe that any planning should also give serious consideration to the possibility of higher plutonium equivalent production values. We, therefore, give a

² In order to accept the estimate of Soviet cumulative U-235 production a minority view finds that it would be necessary to accept major factors of Soviet capability which are in its opinion not sufficiently supported by available evidence. This view believes that the lower limits of the estimated values for the cumulative production of U-235, although high, are the most nearly correct.

³ The term plutonium equivalent is used to cover all reactor products, such as plutonium, tritium, U-233, polonium, etc.

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range of values for Soviet plutonium equivalent production. As of 1960, these values are about 8 to 16 metric tons, and as of 1965 are about 20 to 35 metric tons.^{4 5}

⁴ A minority view does not agree that the most likely value of Soviet cumulative plutonium equivalent production through mid-1960 is that based on site data [redacted]. Instead this view believes sufficient justification exists to warrant considering the uranium ore-based estimate of plutonium equivalent as an equally likely value.

This view is based on the following:

- a) The marked difference between the estimated amounts of uranium ore procured and processed and the smaller amount required for site-based estimate of plutonium equivalent production, coupled with the notation that this difference would involve a 3½-year stockpile of ore plus pipeline and local reserves—utilization which is not considered the most reasonable. [redacted]
- b) The possibility that plutonium is produced at an unidentified site. (Paragraph 40)
- c) The judgment that calculated maximum possible reactor capacities [redacted] are not inconsistent with a plutonium production value about twice as large as the site based estimate. [redacted]

⁵ Another minority view considers the alternative estimate based on ore availability to be too tenuous and hypothetical for useful guidance. This view believes, therefore, that the estimated quantity of uranium ore procured and mined by the USSR is not a suitable parameter for estimating plutonium production. This view recognizes the fact that estimated Soviet uranium ore acquired in excess of that used in producing the amount of plutonium estimated from site data amounts to a stockpile of several years. This view believes such a stockpile to be normally consistent with general Soviet stockpiling practices, with the unpredictable quality of the uranium deposits in the USSR, and with delays and cutbacks in their power program. This view would therefore omit the upper range (the uranium-based portion) of the plutonium equivalent estimate.

NUCLEAR WEAPONS

11. *Weapon Development.* We estimate that the Soviets have available suitable weapon types to meet their present basic requirements. However, we estimate that only marginal improvements will be made in future weapons unless and until nuclear testing is resumed. We do not believe that the Soviets will stockpile nuclear weapons of radically new designs without nuclear testing, and we have no evidence that any Soviet nuclear tests have been conducted since November 1958, although covert tests could have been conducted.

POSSIBLE ALLOCATIONS OF FISSIONABLE MATERIALS

12. We believe that the long-range striking forces have been given the largest allocation of fissionable materials. We believe that at present the USSR's weapon stockpile can support massive nuclear attacks against targets in North America and Eurasia by long-range striking forces

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composed both of missiles and of aircraft of the Long Range Aviation. The size and nature of the materials stockpile imposes limitations on the numbers of weapons available for other air, ground, and naval operations. However, we consider it unlikely that the availability of fissionable materials for nuclear weapons is a factor which in itself significantly limits Soviet policy.

INTERNATIONAL AID AND EXCHANGE

13. During the past year the USSR has concluded bilateral atomic aid agreements with North Korea, Iraq, and Indonesia. As with previous agreements, the Soviets have shown no haste in fulfilling commitments, and appear to be continu-

ing their policy of offering atomic aid only when tangible political return can be expected.

14. A number of exchanges and visits with nuclear aspects have resulted from the over-all US-USSR Agreement on Exchanges and the memorandum of cooperation regarding atomic energy for peaceful purposes. The Soviets have been relatively cooperative in implementing specific exchanges and apparently carry out a well-organized information and collection program during these exchanges. However, both sides have gained information and first-hand observations on each other's nuclear energy program.

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